

Claims:

1. A spin-coating system comprising a supply of process solution in fluid communication with a dispenser through a dispense line, and a pressure sensor that measures pressure of the process solution in the dispense line at a time related to a step of dispensing the process solution, to control timing of a subsequent spin-coating process step.
2. The system of claim 1 wherein the pressure sensor comprises a pressure transducer.
- 10 3. The system of claim 1 comprising a dispense valve between the supply of process solution and the dispenser, and the pressure sensor is between the dispense valve and the dispenser.
- 15 4. The system of claim 1 wherein the pressure sensor detects a beginning or end of process solution being dispensed from the dispenser.
5. The system of claim 1 further comprising a control system for controlling a spin-coating process, wherein the pressure sensor detects a beginning or end of process solution dispense from the dispenser, and the pressure sensor sends a signal to the control system at a detected beginning or at a detected end of process solution dispense.
- 20 6. The system of claim 5 wherein the process solution is a photoresist solution and the pressure sensor signals the control system at a detected end of photoresist solution dispense.
- 25 7. The system of claim 5 wherein the process solution is a developer solution and the control pressure sensor signals the control system at a detected start of developer solution dispense.
- 30 8. The system of claim 1 wherein the process solution is selected from the group consisting of a photoresist, a developer, a solvent, and deionized water.

9. A spin-coating system comprising:

a turntable to support and rotate a substrate;

a dispenser moveable between a dispensing position and a non-dispensing position;

5 a supply of process solution in fluid communication with the dispenser through a dispense line;

a pressure sensor that measures pressure of the process solution;

a process control system that controls application of the process solution to the substrate, the process control system being programmed to interrupt serial control to execute a 10 process command.

10. The system of claim 9 wherein

the system comprises a dispense valve between the supply of process solution and the dispenser,

15 the pressure sensor measures pressure of the process solution in the dispense line, and

the pressure sensor is between the dispense valve and the dispenser.

11. The system of claim 9 wherein the process solution is chosen from the group consisting 20 of a photoresist solution and a developer solution.

12. The system of claim 9 wherein the pressure sensor sends a signal to the control system at the beginning or the end of dispense of the process solution, and the control system interrupts control of the process.

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13. The system of claim 12 wherein the process solution is a photoresist solution and the pressure sensor sends a signal to the control system at an end of photoresist solution dispense.

14. The system of claim 12 wherein the process solution is a developer solution and the 30 pressure sensor sends a signal to the control system at the start of developer solution dispense.

15. The system of claim 9 wherein the process solution is selected from the group consisting of a photoresist, a developer, deionized water, and a solvent.

16. A method of spin-coating a process solution onto a substrate, the method comprising
5 providing a spin-coating system comprising a supply of process solution in fluid communication with a dispenser,

dispensing the process solution through the dispenser onto the substrate, and
measuring pressure of the process solution to detect a beginning or an end of dispense of the process solution by the dispenser.

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17. The method of claim 16 wherein the spin-coating system comprises a supply of process solution in fluid communication with a dispenser through a dispense line, and a pressure sensor measures the pressure of the process solution in the dispense line.

15 18. The method of claim 16 wherein the spin-coating system comprises a dispense line between the supply of process solution and the dispenser, a valve in the dispense line, and a pressure sensor to measure pressure of the process solution in the dispense line between the valve and the dispenser.

20 19. The method of claim 16 wherein the method comprises initiating a later process step based on the beginning or end of process solution dispense measured using the pressure sensor.

20. A method of spin-coating a photoresist onto a semiconductor wafer, the method comprising the steps of

25 spin-coating photoresist solution onto a surface of the semiconductor wafer, and
spin-coating developer solution onto the photoresist material,
wherein the method includes using a pressure sensor to measure one or more of the beginning or end of dispense of the photoresist solution or the beginning or end of dispense of the developer solution.

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21. The method of claim 20 comprising using a pressure sensor to measure the beginning of developer solution dispense, and using a pressure sensor to measure the end of photoresist solution dispense.

5 22. A method of controlling a spin-coating process using a spin-coating system comprising a supply of process solution in fluid communication with a dispenser through a dispense line and a pressure sensor that measures pressure of the process solution in the dispense line, the method comprising the use of a process control system programmed with an interrupt service routine, wherein upon a trigger event relating to a signal related to dispense of process solution
10 measured using the pressure sensor, a hardware interrupt is sent to the process control system, upon receiving the hardware interrupt, the process control system executes an interrupt service routine.

15 23. The method of claim 22 wherein the interrupt service routine includes setting two or more timers to run in parallel for durations, and sending a software interrupt at the end of each timer duration to interrupt the process control system and execute a process command.

24. A spin-coating system comprising a supply of process solution in fluid communication
20 with a dispenser through a dispense line and a pressure sensor that measures pressure of the process solution to detect a malfunction in the apparatus.

25. The system of claim 24 wherein the malfunction is an equipment malfunction.

25 26. The system of claim 24 wherein the system detects a malfunction by measuring pressure of process solution in the dispense line during dispense of the process solution.

27. The system of claim 26 wherein the process solution is selected from the group consisting of photoresist, developer, solvent, deionized water, and cleaner.

28. A method of detecting a malfunction in a spin-coating apparatus, the method comprising measuring a pressure of a process fluid.

29. The method of claim 28 wherein the pressure is measured in a dispense line during a
5 dispense step.